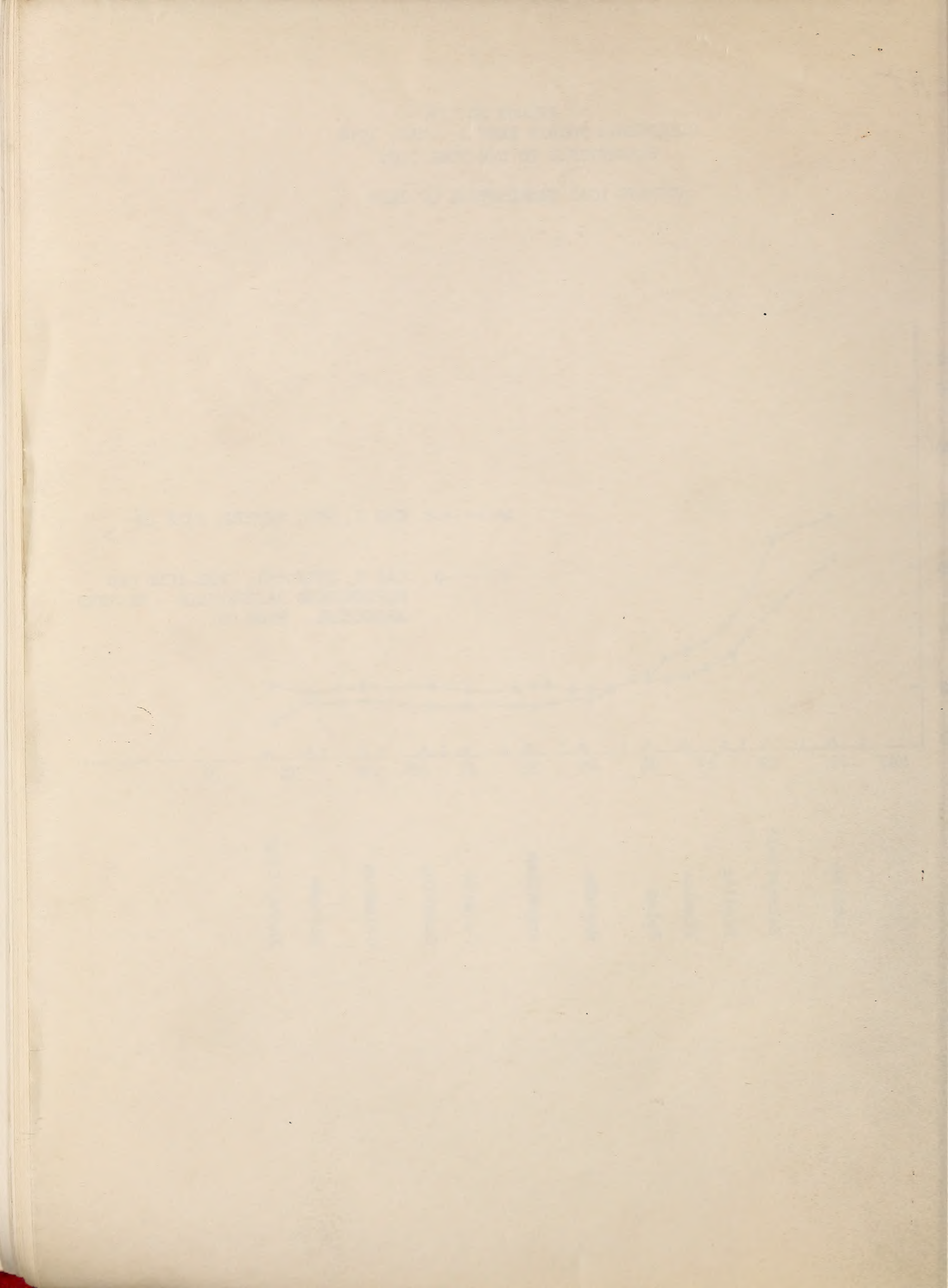


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X SOURCE OF APPLE BRUISES, WENATCHEE, WASHINGTON 1947 X



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## Source of Apple Bruises

Wenatchee, Washington 1947

Apples were secured from four orchards to study the amount and degree of bruising during picking, washing and packing.

To determine bruises taking place during picking the foreman in each case was asked without workers' knowledge to designate fruit that had just been picked by a good or careful picker, a medium picker, and a poor or careless picker. Paper mache trays of 1 Friday carton were filled with fruit taken from the boxes of each class of picker, and apples were placed in 31°F storage at the laboratory the same day.

To determine bruises taking place during washing and packing the authors picked in these same orchards with as little bruising as possible, sufficient fruit of S3 size to fill 5 packed boxes or cartons.

This fruit was taken the same day to one of 4 packing houses where regular labor was employed for dumping on the washer or wiper. After the apples had been cleaned, passed over the sorting rolls, sized, and deposited in the usual rotary bin, the paper mache trays of 3 Friday cartons were filled and this fruit taken to the laboratory for storage at 31°F. The remaining 3 boxes of apples in the bins were packed into apple boxes by an employed packer and the boxes lidded by machine or hand. This fruit was also taken to the laboratory for storage at 31°F. and held with the other lots until examined for bruises on November 19-20.



Table 1. Record of Fruit Used.

Orchard	Location	Variety	Date Picked	Pressure lbs.	Maturity	Packing House
Burhamont	Wenatchee	Starking	9-19-48	14.9	Optimum	Ninth Street Skookum Grs.
Crowder	Manson	Delicious	10-1-48	15.7	Advanced	Lake Chelan Frt. Growers
Hardin	Monter	Delicious	9-22-48	14.8	Optimum	Wenatchee Wenoka Grs.
Auvil	Orondo	Richard	9-30-48	13.8	Very advanced	Auvil Bros.

Table 2. Packing house Methods

Orchard No.	Packer	Methods 1	Liners	Press
	Ninth Street Skookum Grs.	Cutler machine with prewash. Water heated 80° F.	Paper	Power
	Lake Chelan Frt. Grow.	Cutler dual process, Cold water	4-way corrugated pads	Power
	Wenatchee Wenoka Grs.	Cutler dual process, water	4 way cor. pads with crepe paper interliners	Power
	Auvil Bros.	Andy Moe rag wiper	4-way cor. pads crepe paper interliners	Hand

Each packing house used Cutler sorting rolls, weight sizer and rotary bins.





## RESULTS

In examining the fruit few if any apples were found with extremely large bruises of an inch or greater diameter that flattened sides and caused the so called "square apples". It was found that apples after handling carried many minor bruises not apparent to the casual observer. Many of these were small dents, apparently caused by protruders in the washing machine. Following the use of one machine these dents were so numerous and over-lapping that an accurate count could not be made.

Bruises classified as "severe" were generally  $\frac{1}{2}$  inch or more in length or diameter. Though many of these would be considered small bruises, they were listed as "severe" if of sufficient depth and extent to be an individual visual blemish.

## Picking Bruises

Data in table 3 show that picking foremen have quite a good estimation of the characteristics of their laborers. Their judgment was not based upon a study of bruises but was deduced from the speed and general carelessness of individuals, sometimes in a crew of a dozen or more laborers. They show that the poorest workman in orchard No. 4 inflicted fewer bruises than the best picker in orchard No. 1; he also caused fewer bruises than any of the medium pickers in the 3 other orchards. The bruises in apples studied in orchard No. 4 show that careful supervision with a small picking crew may result in very few bruises in the orchard; total picking bruises were ten fold greater in orchard No. 1 where a large crew of transient laborers was employed. Orchard No. 4 had an average of 2 bruises per 100 fruits classified as "severe" whereas orchards 1, 2, and 3 had 14, 13, and 12, respectively. This would indicate that the owners of orchard No. 4 were far above the average in the supervision of their picking operations.

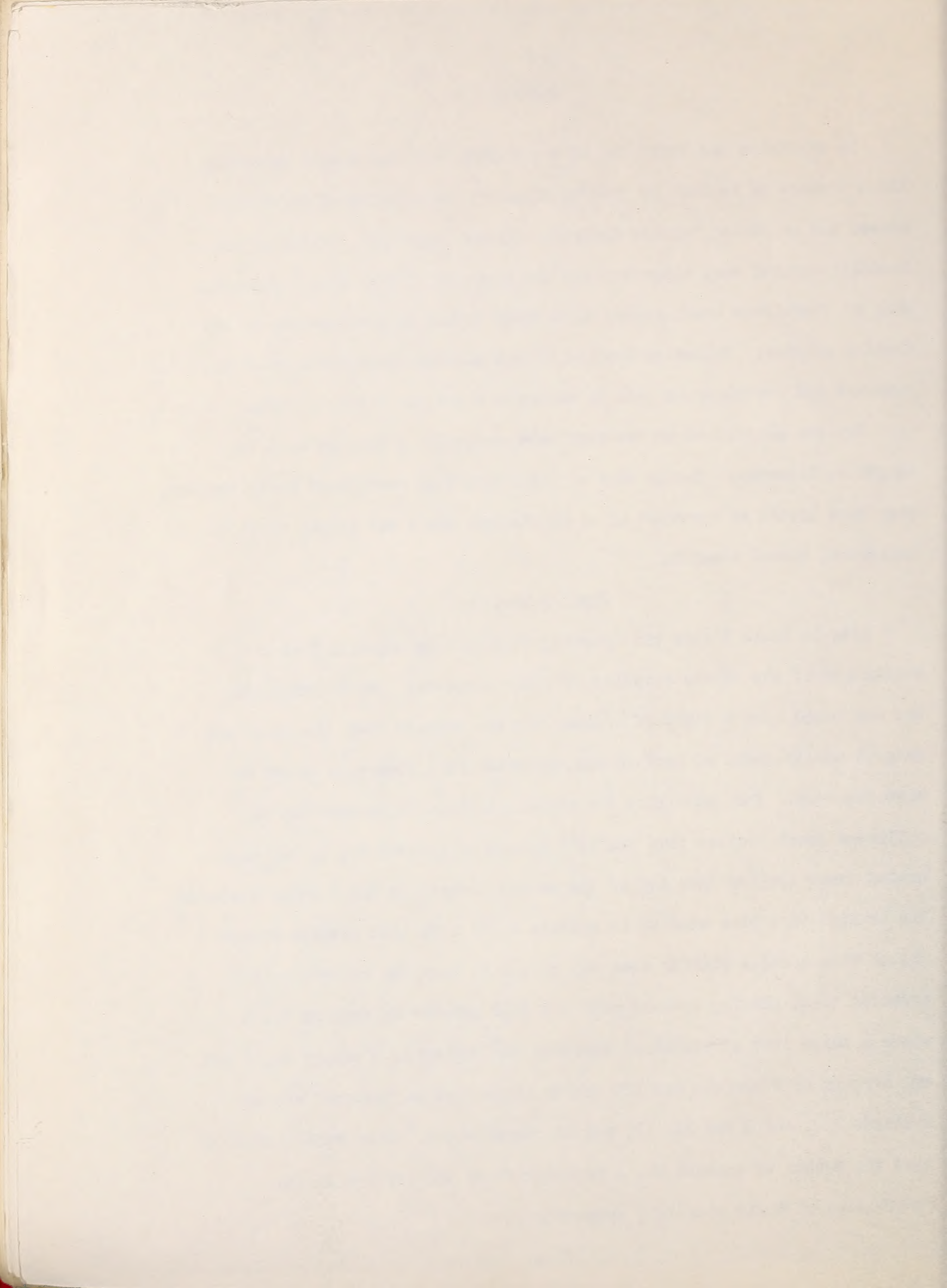


Table 3. Picking Bruses 1 Nov. 19-20, 1948

Orchard	Variety	Pickers lbs.	Good Pickers <sup>2</sup>		Medium Pickers		Poor Pickers		Average	
			Count	Total	Count	Total	Count	Total	Count	Total
1	Sterling	14.9	14	461	15	289	14	497	14	398
2	Delicious	15.7	3	27	16	174	20	202	13	134
3	Delicious	14.3	0	17	13	103	25	84	12	68
4	Delicious	13.8	2	17	0	40	3	52	2	37
Average			5	115	11	162	15	263	10	159

1/ Bruses per 100 fruits .

2/ Characteristics of pickers from judgments of foremen.



### CLEANING AND GRADING DEVICES

Table 4 shows a great difference in those bruises between different packing houses. As the manner of dumping was similar and each house had the same type of grading and sizing equipment, the greatest part of the difference must be attributed to the cleaning equipment. The short rag-wiper inflicted far less bruises than the long washers. No analysis of the gentleness of individual washers was attempted in this study but the data in Table 4 indicate that there was great differences between the Cutler washers used in houses 1, 2 and 3. It is suspected that some of the old type equipment is very rough on fruit.

### CLEANING, GRADING, PACKING AND LIDDING DEVICES

A comparison of the data in tables 4 and 5 shows that packer No. 4 with the dry rag wiper, packing the fruit with box pads and interliners, had a very low count of bruises; it further shows that his total bruises increased from 65 to 200 per 100 fruits through packing and lidding. Packer No. 3, who had 1866 bruises per 100 fruits in the grader bin only increased these to 1877 after packing and lidding. In general, the data show that the severe bruises increased markedly during the packing-lidding operation, but where there were a large number of bruises before the fruit reached the lidding press, as in house No. 1, the increase in bruises counted was not large.

### DISCUSSION AND CONCLUSIONS

The bruises classified as "severe", two of which greatly exceeded  $\frac{1}{2}$  inch, occurring at different stages in picking and packing apples from the 4 orchards are given in table 6. Of bruises that would be objectionable on



Table 4. Sealing and Grading Brulises 1 Nov. 19--20, 1946

Orchard and Block No.	Type of Equipment	Orchard # 1		Orchard # 2		Orchard # 3		Average	
		No. severe Brulises	Total	No. severe Brulises	Total	No. severe Brulises	Total	Severe Brulises	Total
1	Small Process weeder	149	2710	121	2000 <sup>2</sup>	51	2000 <sup>2</sup>	108	2903
2	"	6	195	23	215	12	275	14	195
3	"	30	1875	3	1483	32	2240	22	1866
4	dry ripper	2	68	3	51	2	76	2	65

1/ Brulises per 100 fruits.  
 2/ Total brulises too numerous to count. Totals estimated at 70 per fruit.





the retail stand an average of 13 per hundred fruits occurred during picking against 49 inflicted during cleaning, grading and packing. While the averages indicate less than half of the severe packing house bruises were caused in picking and lidding, an examination of data for separate packing houses shows that, with the exception of house No. 1, packing and lidding caused very more of the larger bruises than cleaning and sorting.

Many small bruises, or dents, that do not seriously affect the appearance of a red apple, especially in the early part of the marketing season, may be of serious consequence from the standpoint of microscopic skin ruptures sufficiently large for the invasion of rot-producing fungi. Data in tables 3, 4 and 5 show that the cleaning equipment may be responsible for a large part of these small bruises. From a decay angle this is much more serious than as if they occur after passing through washing solutions that frequently are highly contaminated with mold spores.

Although the starting apples from orchard No. 1, with from 30 to 50 small bruises per apple, did not always have a poor appearance when examined Nov. 20, this was changed by March. Although stored at approximately 90 percent relative humidity, these apples took on more and more of a dull and battered appearance. The point to look for the greatest reduction of these small bruises appears to be in the cleaning and grading equipment, particularly in the former.

These experiments did not consider the bruises that might be caused in the commercial handling of fruit from the tree to the packing house equipment, it having been necessary to handle the apples with extreme care for the points under study. Individual orchard boxes frequently are



Table 5. Bleeding, Pecking and Licking Bruises?

Orchard and Packer No.	Type of Equipment	Box No. 1		Box No. 2		Box No. 3		Average	Total
		No. severe Bruises	Total Bruises	No. severe Bruises	Total Bruises	No. severe Bruises	Total Bruises		
1	Hand Process Packer	100	21	95	21	127	21	108	21
2	"	96	195	11	11	75	75	87	626
3	"	62	1949	76	1991	41	1790	63	1877
4	Dry Ripper	25	234	20	235	19	190	20	220

- I/ Bruises per 100 fruits .
- 2/ Total bruises for numerous to count. (50-50 per fruit)
- 3/ Note omitted. This box was dropped accidentally.



handled 5 or 6 times with more or less roughness between tree and grading equipment, or, with orchard pallets they may be handled as few as 1 or 2 times. It seems pertinent that a study be made of this phase of apple handling. It also appears important that a more comprehensive analysis be made of bruises resulting from different types of cleaning and grading equipment.

Edwin Smith

I. B. Wright

May 25, 1946



Table 6. Incidence of Severe Bruises<sup>1</sup>

Operation	Orchard or Packing House				Average
	#1	#2	#3	#4	
1. Picking	14	13	12	2	10
2. Washing-Grading	104	14	22	2	37
3. Packing-Lidding <sup>2</sup>	4	73	38	18	33
4. Washing-grading-Packing-Lidding	108	87	60	20	69

1/ Disfiguring bruises per 100 fruits

2/ Packing-lidding data are the differences between lines 2 and 4.

